completed at the same laboratory September 6, and differs from the preceding principally in the proportions and the system of internal bracing. It is about 2 feet deep, 8 feet broad, and 8 feet long. The great manhole kite, or the Jumbo, was completed October 18, 1898, at the Beim Breagh laboratory. It is about 16½ feet long, 5½ deep, and 11 broad. The front and rear cells are rectangles 5½ by 5½ by 11 feet, and they are separated by a blank space of the same dimensions.

Before experimenting with these Professor Bell and his assistants had devised a large number of peculiar forms, which, although they may not be of much value to the meteorologist as a means of raising meteorographs to explore the upper air, yet are of great interest to the student of hydrodynamics as offering many interesting problems for his study. Some of these new forms Professor Bell denominates kites with radial wings. Others have, instead of wings or cells, various conical appendages or members, but all have the common characteristic that two similar members are separated by a rod whose axis coincides with the axis of the front and rear member, so that in general they may all be denominated spool kites; these fly by a cord attached at some point in the axis of the spool between the kite frames. All these forms were devised and used before June 24, 1898, and most of them are shown in the sketches given on Chart No. XI, where they are numbered as follows:

No. 1. The two radial winged kite.
No. 2. The three radial winged kite.
No. 3. The giant three radial winged kite.
No. 4. The four radial winged kite.
No. 5. The five radial winged kite.
No. 6. The two winged kite with conical tail.
No. 7. The two winged kite with revolving fan tail.
No. 8. Conical spool kite.
No. 9. Conical spool kite.
No. 10. Conical spool kite.
No. 11. Conical spool kite.
No. 12. Conical spool kite.
No. 13. Conical spool kite.
No. 14. Conical spool kite.
No. 15. Semiconical spool kite.
No. 16. Semiconical spool kite.
No. 17. Double cone kite.

Of all these forms Professor Bell found the kites with three radial wings, Nos. 2 and 3, most interesting. The reader will notice that in all these kites the axis of the spool has an extra length, so that the two members may be set at different distances apart. The string by which the kite is flown is also adjustable at different points, so as to determine the best angle of flight. Photographs were taken of the four-winged and the five-winged kites when flying in the air, the string being attached to the top of a tall flagstaff; the appearance of the kites shows that the angles of inclination were not favorable to the attainment of great heights.

Perhaps the most remarkable kites were made by giving a twist to each of the three or four individual radial arms at each end of a spool, and allowing each set to revolve freely about the axis of the spool independently of the other set. This freedom to revolve seemed to make no difference in the flying, but decidedly increased the steadiness of the kite. The pull on the string was not sensibly diminished when the wings revolved, as compared with that when they were stationary. The angle of elevation of the kite string was not stated by Professor Bell.

Will it not be possible to add to the ordinary Hargrave kite a small fan driven by the wind to furnish motor power for use in connection with the self-registering meteorological apparatus? It would seem that the whirling fan does not add sensibly to the pull on the wire at the reel. In fact, it is well known that this pull depends on the action of the wind on the long line of wire, even more than on the wind action at the kite itself.

NEWSPAPER FAKES.

It is frequently the duty of the Editor to enter into correspondence with those who contribute to the daily press circumstantial accounts of remarkable phenomena, such as ball lightning, falling meteors, tidal waves, earthquakes, hailstorms, showers of fishes, frogs, pollen, and numerous other quasi meteorological phenomena.

It would surprise the uninitiated to discover how many of these newspaper items are misleading exaggerations, and an intelligent man can but wonder how it is that so many sensational accounts of ordinary meteorological phenomena come to be published. Apparently the fault is not always with the editors of the newspapers, but lies with the news agents who have authority to write or telegraph to headquarters whatever they think will interest the readers of the paper or benefit the town that they represent. Thus, on May 2, a press dispatch from Vincennes, Ind., flooded the whole country with the announcement that—

> Councilman ——— and Contractor ——— picked up the pieces of a snow-white flinty meteor whose external surface was of orange or yellow color. The meteors, for there were two of them, had struck some large stones in their fall and broken to pieces.

At the request of the Editor the voluntary observer of the United States Weather Bureau at Vincennes kindly obtained a piece of the stone and some further description of the event. The stone proves to be merely a fragment of a quartz boulder that had been discolored on the outside by red clay soil. If it fell as described, it must have been thrown from a distance by blasting or some other method. A fairly intelligent news gatherer or press agent might easily have seen that it had none of the characteristics of a meteoric stone and might have saved the people the bother and expense of telegraphing, printing, and reading his interesting little item. Our public schools generally teach enough science to enable a news gatherer to avoid being duped. There is no excuse for one who wilfully or ignorantly misleads his readers. If one prepetrates a fake or hoax in these small matters how shall we know when to trust him in the more important items of political and financial history?

While the Editor of the MONTHLY WEATHER REVIEW desires to secure interesting items, yet he does not wish anything fictitious or misleading. The voluntary and regular observers will confer a favor if, in sending him important newspaper items, they also add such criticisms of their own as will show the amount of credence to be given to the articles.

UNIVERSITIES AND METEOROLOGY.

The hearty interest in the progress of science that is felt in every branch of the Department of Agriculture is well set forth in an article by the Chief of the Weather Bureau, published in the Ohio State Journal for May 7. Among other things, Professor Moore said:

> Meteorology is so interwoven with other natural sciences that we must look to the technically trained men of the future to explain many things of which we are now ignorant. This science presents to the student unlimited opportunities for theoretical investigations. At the same time it contains problems that engage the serious attention of practical men. A thoroughly equipped investigator should be, at least, a physicist, an astronomer, and a mathematician. As a rule, only graduates of universities and scientific schools have this educational foundation. This establishes a close relationship between educational institutions and the scientific departments of the Government. One is the training ground, the other an enlarged field of operations. * * *

Many of the Weather Bureau stations are located in cities in which there are one or more colleges. The Secretary has directed that at such stations, student observers be employed whenever by so doing, it is possible to economically perform the service of the Weather Bureau and at the same time permit poor, but ambitious boys to get a scientific education. * * * To-day there are about twenty-five young men in different subordinate capacities in the weather service who are thus working out their scholarships. * * * It is the lifting up from the lower to the higher strata of society, rather than the cultivation of a few favored ones at the top, that inures to the homogeneity and welfare of the people.

NOT BALL LIGHTNING.

The April number of the Climate and Crop Report for Virginia publishes an interesting case of lightning, described by Mr. G. E. Murrell at Colemans Falls, now Fontella, Bedford Co., Va.

Although this lightning is described as a globe, six or eight inches in diameter, traveling from northeast to southwest horizontally, at about 100 feet above the earth, and diminishing in size as it passed through three locust trees successively, yet the Editor notes that the characteristic feature of ball lightning, viz, its very slow motion and its eventual explosion at the end of its journey, without doing much damage, were all absent, and we must hesitate to consider this as a well authenticated case of genuine ball lightning.

EMPIRICAL GENERALIZATIONS FOR SOUTH CAROLINA.

Attention has been called to the fact that—

In South Carolina on April 5 snow and ice occurred in that State, the snow being confined to the northern border counties. It is a coincidence worthy of notice that in the cold year of 1835 snow fell in April also. It undoubtedly takes more than two so widely separated years to establish a rule, but nevertheless the fact is worth remembering while sowing seeds of plants that are susceptible to cold, that when extremely low temperatures occur in February there are likely to be unusually cool periods in the two following months.

We have here what seems to be an excellent illustration of the ease with which empirical rules are framed without a very substantial basis. As we understand the above quotation, it says that occasionally snow and ice have occurred in April, and that, therefore, we may conclude that when extremely low temperatures occur in February there are likely to be unusually cold periods in March and April.

Of course this conclusion does not follow from the premises, and it would be interesting to know just what basis there is for it. Can not the author give us the details of an examination of many years instead of two?

RADIANT HEAT FOR THE PREVENTION OF FROST.

The April report of the California Section quotes an article by E. W. Holmes, of Riverside, Cal., who says that two or three years since the Messrs. Wright Bros., of Riverside, established a 35-horsepower boiler and a large quantity of pipe in order to supply steam to 3 acres of orchard. The steam was made to escape horizontally near the ground, and for each outlet there was a cloud of steam 10 feet long and 3 feet wide; one hundred such vents did the best work for these particular dimensions of boiler and orchard. The steam was turned on with a pressure of 40 pounds, but that would soon drop to 20 pounds. The temperature of the air was raised 3° F. whenever the steam was turned on. It was the heat produced and not the moisture thrown off that was efficacious. The coal consumed by such a system is no more than that used when burned in wire baskets for the purpose of raising the temperature of the air by the direct action of its radiant heat. The production of moisture as a means of preventing frost effects has been a failure here in Riverside, though unquestionably the condensation of steam helps to overcome the cold. The blanket of cold air has no great depth in the valley, and by the use of many small fires it is possible to warm this cold stratum until all shall be of about the same temperature as at the tops of the trees.

Although there are times when the methods of smudging and of running water are useful, yet when we want to produce heat the simplest and least expensive process is the wire basket of burning coals. We have tried the method of crude oil and tar burning in sheetiron kettles; this method furnishes satisfactory heat cheaply, but the clouds of lampblack are so injurious that it is generally discarded. We have tried the raising of the dew-point sufficiently to prevent frost by the evaporation of water into immense quantities of steam; we have tried shallow vats for boiling water, but this method was also insufficient.

When 20 to 40 baskets of soft coal per acre were burned, the temperature was raised from 3° to 5°, or possibly more, and this change of temperature was sufficient. In one orchard a lathe screen was built but the cost was nearly $400 per acre. The method of piping steam through the orchard has been explained above. The most popular system is the burning of coal in a basket, which costs about $4 per acre for the baskets, and $2.50 per night for the coal. The replenishing of the baskets for the second night and the lighting of them is the principal item of labor.

THE PRESENT STATE OF LONG RANGE FORECASTING.

In the Nineteenth Century for March, 1899, pages 418–423, Kropotkin reviews the present state of daily weather forecasting and the possibility of responding to the general desire for predictions of the coming weather several days, if not weeks and months, in advance. He briefly considers the two methods most commonly studied, with a view to laying the basis for such long range predictions, viz: (1), the determination of cycles or periods of recurrence of hot and cool, dry and wet weather; (2), the study of the different types or spells of weather, their duration, and the order of succession in which they follow each other.

Kropotkin enumerates as established, or at least plausible, the so-called 11-year, or more properly, sunspot periodicity in temperature, rainfall, storms, etc; the 35-year period of Brückner; the lunar latitude periods of A. Poincaré and other French students; the 19-year, or nutation period of H. C. Russell; the 7-year period of Murphy; the 26.68-day period of Professor Bigelow; the 5.5-day period of Mr. Clayton; the cold waves of May; the nine alternations of heat and cold annually, as indicated by Mr. Buchan, and the three short periods indicated by Mr. Lamprecht. He concludes that the knowledge of these many waves will certainly be very helpful for long period weather forecasts.

Again, with regard to types of weather, Kropotkin enumerates the system of long period forecasts evolved in India by Blanford and Eliot, in which the probable strength and character of the monsoon rains of summer and the dry monsoon of winter is foreseen several months in advance; also the system evolved in Oregon by Mr. B. S. Pague, forecast official of the Weather Bureau, in which the coming summer weather is predicted in the spring and the winter weather predicted in the autumn; also the results of the studies of Abercromby and van Bebber, who discriminate five distinct types and five subtypes of weather which have a tendency to prevail at certain seasons, to be maintained for several days in succession, and each to be followed by some other specific type.

He states that "some modest attempts at forecasting